

# Spontaneous wound dehiscence after penetrating keratoplasty

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Received: 2013-08-05

Accepted: 2013-12-02

## Abstract

• Spontaneous wound separation may be developed even months after suture removal especially in the context of long-term corticosteroid therapy. A 68-year-old Caucasian woman presented to our cornea clinic with spontaneous wound dehiscence after her third penetrating keratoplasty (PKP) which was performed three years ago. An Ahmed glaucoma valve (New World Medical, Rancho Cucamonga, CA) was inserted ten months after the third PKP, which successfully controlled intraocular pressure (IOP). At the examination, the last sutures were removed eight months ago and she was using flourometholone 0.1% (Sina Darou, Tehran, Iran) with a dose of once a day. There was one quadrant of wound dehiscence from 8 to 11 o'clock associated with anterior wound gape and severe corneal edema. Resuturing was performed for the patient. At the one month examination, the corneal edema was resolved and best corrected visual acuity was 20/200 mainly due to previous glaucomatous optic neuropathy. Caution about the prolonged use of corticosteroids is necessary. Topical immunosuppressives could be a promising choice in this field.

• **KEYWORDS:** wound dehiscence; penetrating keratoplasty; review; spontaneous

**DOI:10.3980/j.issn.2222-3959.2014.05.29**

Foroutan A, Tabatabaei SA, Behrouz MJ, Zarei R, Soleimani M. Spontaneous wound dehiscence after penetrating keratoplasty. *Int J Ophthalmol* 2014;7(5):905-908

## INTRODUCTION

Wound dehiscence after penetrating keratoplasty (PKP) may occur after trauma or suture removal. It may result in delay in visual recovery, corneal graft edema, graft rejection, endophthalmitis and supra choroidal hemorrhage<sup>[1-3]</sup>. Spontaneous wound dehiscence has been rarely reported to occur before or soon after suture removal<sup>[4,5]</sup>. Given the increased number of penetrating keratoplasties, the incidence of complications including wound dehiscence has been increased apparently<sup>[6]</sup>. The avascular stroma of the cornea altering wound healing, compared to other wounds in the body, causes differences in the wound structure after wound apposition exposing transplanted cornea to the wound rupture. Predisposing factors for wound dehiscence include higher age, increased intraocular pressure (IOP), obesity, early suture removal, prolonged postoperative steroid use and poor corneal wound healing<sup>[1-3]</sup>. Most of spontaneous wound dehiscence occurred in the first weeks after suture removal<sup>[1-6]</sup>. Here in, we report a rare case of spontaneous wound dehiscence after PKP while all of the sutures had been removed eight months ago and then we'll focus on the literature of spontaneous wound dehiscence.

## CASE PRESENTATION

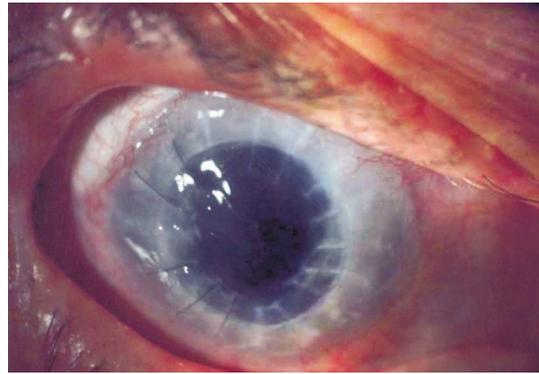
A 68-year-old one-eyed slim Caucasian woman who had undergone her third PKP three years ago in right eye was referred to our cornea clinic. The first PKP was performed twelve years ago because of pseudophakic bullous keratopathy following a complicated cataract surgery. The 8.25 mm diameter corneal donor was sutured to a 7.75 mm diameter bed by sixteen separate 10-0 nylon sutures. Two years later, a filtering surgery was done because of medically uncontrolled post PKP glaucoma. Her IOP was controlled using only timolol ophthalmic drop 0.5% (Sina Darou, Tehran, Iran). Four years after operation, she underwent the second PKP due to persistent corneal edema secondary to an episode of endothelial rejection. However after five years, she underwent her third PKP using sixteen separate 10-0 nylon sutures again related to the corneal decompensation due to another episode of refractory endothelial rejection. An Ahmed glaucoma valve (New World Medical, Rancho Cucamonga, CA, USA) was inserted ten months later

(putting the tube behind the iris) because of refractory glaucoma and failed trabeculectomy. IOP was always under 14 mm Hg using timolol 0.5%. Finally the last sutures were removed eight months ago and she continued flourometholone 0.1% (Sina Darou, Tehran, Iran) with a dose of once a day. Best corrected visual acuity (BCVA) after suture removal was 20/100 mainly due to glaucomatous optic neuropathy. Her left eye was blind because of old congenital problem leading to phthisis of the eye. At presentation to our clinic, visual acuity was hand motion and there was severe corneal edema. Because of the severe corneal edema, iris and intraocular lens were seen hardly. There was one quadrant of wound dehiscence from 8 to 11 o'clock associated with anterior wound gape; only the endothelial border remained aligned. The Seidel test was negative and there was no iris incarceration. Systemic vancomycin 1 g twice a day IV and ceftazidime 1 g three times a day IV were injected for three days. In the operation room, wound dehiscence was larger than we thought beginning at 7 o'clock and extending toward 12 o'clock, we performed resuturing with long bites because of the graft-host junction edema associated with a bullous dose of 500 mg IV methylprednisolone. Subconjunctival cefazolin and betamethasone were injected following the surgery, and then the patient was placed on topical betamethasone 0.1 % (Sina Darou, Tehran, Iran) (1 drop 6 times daily) and ciprofloxacin 0.3 % (Sina Darou, Tehran, Iran) (1 drop 4 times daily). At the one month examination of the follow up, the corneal edema was resolved and best corrected visual acuity was 20/200 (Figure 1).

### DISCUSSION

Increased number of keratoplasties in the last decade, mandates more comprehensive studies about postoperative complications [7]. One of the important complications is wound dehiscence, that may be associated with adverse effects such as failed graft and endophthalmitis[8]. There have been different reports of wound dehiscence incidence ranged from 0.6% to 5.8% in the literature[9-12].

Wound healing process begins with lying down of new extracellular matrix and collagen fibrils in the graft-host junction, these collagen fibrils are thicker and non parallel, however during the next months, collagen fibers re-embed more parallel to the corneal surface. The corneal graft-host junction never regains normal tensile strength after PKP [13]. The other complicating factor is avascular corneal stroma, a major cause of slow wound healing after PKP. Incomplete wound healing after PKP leads to a structurally weak graft-host junction during patient's life and puts the cornea to the risk of wound dehiscence. Wound dehiscence may occur any time after PKP. It has been reported years and even after 33y after PKP [14], that is why the globe rupture after blunt trauma occurs in the site of graft host junction even in the presence of sutures [13]. There are two major types of wound



**Figure 1** Slit photograph of the patient at the one month examination Temporal suture (9 o'clock) has been removed because of excessive tightness.

dehiscence: traumatic and suture related. The other types that are rarely encountered are infectious keratitis related wound dehiscence and spontaneous wound dehiscence[15]. Traumatic wound dehiscence has been a focus for most of the studies in this field and fewer cases of other causes have been reported. The incidence of traumatic wound dehiscence ranged from 1.28% to 2.53%[14]. In the traumatic events, blunt traumas and falls were the most common causes of wound dehiscence. In our previous report for traumatic wound dehiscence, we reported seven cases of wound dehiscence due to blunt trauma with a mean age of 21y, given engaging this age group in contact exercises; it was compatible with other studies but younger than some other studies [16-19]. All of our cases were associated with lens extrusion. The site of wound dehiscence was located in superior and superotemporal sites in five cases [16]. In another study the mean age of wound dehiscence for traumatic cases was 70.1y and 69.5y for all types of wound dehiscence, the authors also introduced inferior location as the most prevalent location of traumatic wound separation in their study [20]. The source of the difference in age in various reports may be socioeconomic and cultural status of the patients in each study and also relatively low incidence of such complication; however the patient age is an important factor in developing wound dehiscence especially in nontraumatic cases, because the rate of healing process is slower in older patients. Whichever location is the common site for traumatic wound dehiscence, superior or inferior; non traumatic and suture related wound dehiscences usually take place with a predilection to the temporal site [20]. Compatible with these studies, in our case wound dehiscence occurred in the temporal quadrant of the cornea.

In one study, early suture removal has been suggested to cause wound dehiscence after suture removal, using one continuous suture that had been removed 3 to 8mo after PKP, the authors reported 28% risk of wound dehiscence; they concluded that so early suture removal was associated with wound dehiscence, they also mentioned that nylon material is

**Table 1 Review of literature for spontaneous wound dehiscence**

Study	n	Mean age (a)	Sex	Diagnosis	PKP-SR	Site	Result	Time <sup>1</sup>	Suture
<sup>2</sup> Bore and Kremer <sup>[1]</sup>	4/207	73.5	3M; 1F	3 PBK; 1 corneal scar	22.18mo	3 inferior	2	2-3wk	Continuous×2; interrupted×1; CCIS×1
Das <i>et al</i> <sup>[14]</sup>	10	65	3 M; 7F	4 FED; 2 PBK; 3 KCN; 1 IK	16mo	7 temporal	80%>6/18	NA But after SR	7 eyes continuous
Elder and Stack <sup>[18]</sup>	1	58	F	FED	12mo			4d	Continuous with 8 separate
Renucci <i>et al</i> <sup>[20]</sup>	6	51.7	3M; 3F		0.68a			7d-3wk	
Ugarte and Falcon <sup>[4]</sup>	1	36	Male	KCN	15mo	Superotemporal	6/5	1wk	Continuous
Jayaram and Falcon <sup>[26]</sup>	1	36	Male	KCN	15mo	Superior	6/6	10	Continuous
Abou-Jaoude <i>et al</i> <sup>[5]</sup>	5/324				months			11.6 (3-18d)	
Christo <i>et al</i> <sup>[27]</sup>	9/361(2.4%)			5 FED; 4 KCN	10.1mo				
Spigelman <i>et al</i> <sup>[28]</sup>	3								
<sup>2</sup> Forstot <i>et al</i> <sup>[29]</sup>	2								
Johansen <i>et al</i> <sup>[6]</sup>	2	28	2M	2 KCN	3d suture in place	One of them: temporal	20/25	2-4d after operation	
Perry and Donnenfeld <sup>[30]</sup>	1								
Davison and Bourne <sup>[31]</sup>	2/84								

PKP: Penetrating keratoplasty; PBK: Pseudophakic bullous keratoplasty; FED: Fuchs's endothelial dystrophy; KCN: Keratoconus; IK: Interstitial keratitis; NA: Not available; CCIS: Combined continuous interrupted suture; PKP-SR: The time period between PKP and suture removal. <sup>1</sup>Time of wound dehiscence after PKP; <sup>2</sup>All reported cases were associated with endophthalmitis.

associated with lower tissue reactivity, and it makes the wound more unstable comparing to silk material<sup>[21]</sup>. Binder *et al*<sup>[3]</sup> reported 5.7% incidence of wound dehiscence after suture removal and they reported no difference between different types of suturing (continuous, interrupted, or combined) in wound dehiscence using nylon as suture material. However Pleyer and Hartmann<sup>[8]</sup> mentioned that suturing technique is an important and key factor for appropriate wound healing and using a routine double running suture with 10-0 and 11-0 nylon with a delayed removal after one year and only in patients who had corneal astigmatism >4.5 diopters or noncorrectable irregular astigmatism, they reported a 2% risk of wound dehiscence. In a study on fifty one cases of wound dehiscence, the mean age was 69.5y. From the literature, it infers that there is no difference between male and female in the incidence of wound dehiscence<sup>[20]</sup>. Some studies has proposed higher incidence of traumatic wound dehiscence in men, because of engaging in physical activity<sup>[10]</sup>. According to the nature of the wound dehiscence, it comes to mind that suture related and spontaneous subtypes are related to the technique of wound closure (as described by Pleyer and Hartmann<sup>[8]</sup> above) and also wound healing (for example aged vs young patients). Thus they usually occur in the early post operative period. Despite of these two types of wound dehiscences, traumatic wound dehiscence may occur in the late postoperative course, although most of the wound dehiscences occur early in the post-operative period. Renucci *et al*<sup>[20]</sup> concluded that spontaneous wound dehiscences had a mean lapse time of 0.68y from primary operation. Table 1 shows the studies that had been related to the spontaneous wound dehiscence; as the table shows, they occurred in the

early weeks after surgery. Also it discloses that probably most of the spontaneous wound dehiscences were associated with continuous suturing technique. However wound dehiscence in our case occurred about eight months after suture removal. The cause might be continued usage of topical corticosteroid that was prescribed according to the idea of long-term topical corticosteroid therapy after high risk grafts especially in patients with pseudophakic bullous keratopathy<sup>[22,23]</sup>. Spontaneous wound dehiscence has been associated with long-term use of topical corticosteroid to prevent graft rejection. Corticosteroid drops are known to delay healing process and cause weakness of the corneal graft-host junction, because these drops are known to slow down healing of corneal tissue<sup>[24]</sup>. Topical immunosuppressive drops such as tacrolimus 0.03% ointment may be a promising drug for immunosuppression in the management of high-risk grafts and proper substitute for the corticosteroid therapy<sup>[25]</sup>. Another predisposing factor for wound dehiscence is glaucoma, although IOP was controlled for our case in the last months.

Wound dehiscence could result in corneal edema and finally graft failure, graft rejection, endophthalmitis and suprachoroidal hemorrhage. However the donor cornea became clear after wound apposition in our case and there was not any other complication.

In summary, from pathophysiological aspects, wound dehiscence may be related to avascular donor host junction and little tissue reaction to nylon material. There are several factors predisposing for wound dehiscence; they include age, increased IOP, obesity, suture removal and prolonged postoperative steroid use. Most of the cases of spontaneous wound dehiscence occur in the first weeks after suture

removal. However wound separation developed eight months after suture removal in our patient mainly because of long-term corticosteroid therapy necessitating more caution about prolonged usage. Topical immunosuppressives could be a promising choice in this field.

#### ACKNOWLEDGEMENTS

**Conflicts of Interest:** Foroutan A, None; Tabatabaei SA, None; Behrouz MJ, None; Zarei R, None; Soleimani M, None.

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